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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/661,651	09/12/2003	Brian Michael Davis	13DV13813-5	9351
49305	7590	01/17/2006	EXAMINER	
JAGTIANI + GUTTAG 10363-A DEMOCRACY LANE FAIRFAX, VA 22030			CULBERT, ROBERTS P	
			ART UNIT	PAPER NUMBER
			1763	

DATE MAILED: 01/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/661,651

Applicant(s)

DAVIS ET AL.

Examiner

Roberts Culbert

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Arguments*

Applicant's arguments filed 10/25/05 have been fully considered but they are not persuasive to overcome the rejections of the previous Office Action.

Applicant has argued that Lowe and the APA create rotationally imbalanced blisks. However, the admitted prior art and Lowe clearly teach milling to create balanced blisks..(See Col. 2, Lines 58-64 of Lowe and Paragraph 6 of the APA)

Applicant has argued that unlike Walker, it is not the intention of the claimed invention to make "exact" blades within the blisk, but instead to alter the blade so that the blisk is balanced. However, the additional machining or "balancing" steps of the APA and Lowe are clearly used to provide more "exact" dimensions to individual blades by changing the chord or thickness. Walker teaches that chemical machining may be used to change the dimensions of a mechanically machined contoured metal part with high precision.

Applicant has argued that the suggestion that forming a blisk to "more exact dimensions" will lead to improvement in the balance of the blisk is not supported by Walker or the other prior art. However, Lowe teaches forming more exact dimensions using "additional milling" to improve balance (Col. 2, Lines 49-64) The APA teaches *"Another prior method is to mechanically polish or machine the blisk to remove metal from the blades, flanges and/or platform region between the blade roots to adjust the rotational balance of the blisk, e.g., by offset/eccentric grinding of the blisk. The disadvantages of mechanical machining methods include the risk of damaging the blades or other portions of the blisk, the difficulty in finely controlling the changes in the chord and/or thickness of the blades"*

Applicant has argued that the Fishter et al. process removes an impurity from the part rather than altering the shape. However, there is no support for the argument, either in the cited portions of Fishter et al, or in the reasoning provided by Applicant. The Fishter reference teaches a suitable etchant for nickel superalloys and removes (etches) a portion of the material by chemical attack.

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Applicant has argued that the purpose of Blake is to eliminate pitting rather than adjust dimensions. Applicant is incorrect. Blake clearly teaches milling the workpiece (Col. 3, Line 65- Col. 4, Line 2)

Applicant has argued that Law monitors etching of a pattern instead of monitoring the change in dimensions of a part. However applicant has not explained how etching a part does not alter the shape of a part.

Applicant has argued that the office action fails to address where the art teaches use of metals in a reference panel so that the reference panel is made from the same metal as the blade. Law teaches the use of a reference panel made of the same metal as the workpiece in order to determine etch rate for the process. (See Col. 1, Lines 5-38)

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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**Claim 1, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) or, alternatively U.S. Patent 6,077,002 to Lowe in view of John R. Walker, *Machining Fundamentals*, 2000 pp. 511-516.**

Regarding Claim 1, the admitted prior art (APA) teaches a method of milling a gas turbine engine blisk (bladed disk) having a hub and a plurality of blades made of metal spaced circumferentially around the hub and extending radially outwardly therefrom, each of the blades of the blisk having a leading edge, a trailing edge, a chord defined by a line extending from the leading to the trailing edge, a convex curved surface, a concave curved surface and a thickness defined between the convex and the concave surfaces, the method comprising the step of treating at least one blade of the blisk with a mechanical machining process for the metal that the at least one blade is made of for a period of time sufficient to change the at least one of the chord and thickness. (See Paragraphs 2-6 of the instant application)

Alternatively, Lowe teaches a method of selective milling a gas turbine engine blisk having a hub and a plurality of blades made of metal spaced circumferentially around the hub and extending radially outwardly therefrom, each of the blades of the blisk having a leading edge, a trailing edge, a chord defined by a line extending from the leading to the trailing edge, a convex curved surface, a concave curved surface and a thickness defined between the convex and the concave surfaces, the method comprising the step of treating at least one blade of the blisk with a mechanical machining process for the metal that the at least one blade is made of for a period of time sufficient to change the at least one of the chord and thickness so that the blisk is balanced. (See Column 1, Line 1 – Column 2, Line 64).

Regarding Claim 9, the admitted prior art (APA) teaches a method for balancing a gas turbine engine blisk that is rotationally imbalanced comprising the steps of evaluating the rotationally imbalanced blisk to determine the direction and magnitude of the rotational imbalance, identifying at least one blade of the rotationally imbalanced blisk for potential treatment to correct the rotational imbalance of the blisk, determining which blade should be treated to correct the rotational imbalance, and selectively treating the determined at least one blade of the blisk with a mechanical machining process for the metal that the at least one blade is made of for a period of time sufficient to change the at least one of the chord and thickness. (See Paragraphs 5-8)

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Neither Lowe, nor the admitted prior art expressly teach treating the blade with a chemical etchant.

However, Walker teaches that it is old in the machining art to use chemical etching to remove material from a contoured or shaped metal part. Walker further teaches that chemical etching is complementary conventional milling processes to form parts having more exact dimensions (See Page 512). In view of Walker, it would have been obvious to one of ordinary skill in the art at the time of invention to modify the conventional milling process disclosed in Lowe and the APA to include chemical etching (milling), in order to provide exact dimensions for the blisk, thereby reducing blade-to-blade variations and improving the balance of the blisk.

Regarding Claim 10, the APA in view of Walker does not explicitly teach determining whether the blisk is rotationally balanced, and if it is not, repeating the chemical etching process. However, it would have been obvious to one of ordinary skill in the art at the time of invention to repeat the process in order to determine that the blisk is balanced.

**Claims 2-4 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) or, alternatively U.S. Patent 6,077,002 to Lowe in view of John R. Walker, *Machining Fundamentals*, 2000 pp. 511-516, and in further view of U.S. Patent 4,534,823 to Fishter et al.**

Regarding claims 2-4, and 11-13, as applied above, Lowe or the APA in view of Walker teach the method of the invention substantially as claimed, but do not expressly teach the chemical etchant comprising at least one acid selected from hydrofluoric, nitric, hydrochloric, sulfuric, and mixtures thereof.

However, the use of etchant solutions containing, for example, nitric acid is old in the art of etching metals used in the production of turbine blades and the like. For example, Fishter et al. teach that solutions for etching gas turbine superalloys include solutions of hydrochloric and nitric acid. (See Col. 2, Lines 14-16)

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In view of Fishter et al, it would have been obvious to one of ordinary skill in the art at the time of invention to use a chemical solution including the listed acids since the same were known at the time of invention to be suitable for etching superalloy gas turbine materials.

**Claims 5-7 and 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) or, alternatively U.S. Patent 6,077,002 to Lowe in view of John R. Walker, *Machining Fundamentals*, 2000 pp. 511-516, in view of U.S. Patent 4,534,823 to Fishter et al. and in further view of U.S. Patent 5,126,005 to Blake.**

Regarding claims 5-7 and 14-17, as applied above, Lowe or the APA in view of Walker and Fishter et al. teach the method of the invention substantially as claimed, but do not expressly teach immersing at least two blades of the blisk in the solution, the at least two blades of the blisk including the at least one blade to be treated with the solution and at least one blade not to be treated with the solution, and which comprises the further step of applying to the surfaces that are potentially in contact with the solution of the at least one blade that is not to be treated with the solution a maskant that is chemically resistant to the solution, the maskant being applied to the surfaces prior to immersion of the at least two blades of the blisk in the solution.

However, the use of a plastic film or coating as a maskant to selectively etch a surface is notoriously old and well known in the chemical solution etching art. For example, Blake teaches that a plastic film may be applied prior to immersion in a chemical solution in order protect regions of a metal part in which chemical milling is not desired. (See Col. 2, Lines 7-50) Blake further teaches that it is known to remove the maskant and repeat the etching process (See Col. 1, Lines 30-44)

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the process of the APA or Lowe in view of Fishter et al. to use a plastic film or coating as a maskant as shown by Blake, and to immerse at least two blades in the solution and to selectively mask areas of the turbine blades because this will allow for etching selected portions of the blades without having to move the blisk, thus decreasing processing time. Further, It would have been obvious to remove the maskant and repeat

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the etching process in order to remove material from the desired portions of the blades, thereby balancing the blisk through the etching process.

**Claims 8 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (APA) or, alternatively U.S. Patent 6,077,002 to Lowe in view of John R. Walker, *Machining Fundamentals*, 2000 pp. 511-516, in view of U.S. Patent 4,534,823 to Fishter et al. and in further view of U.S. Patent 5,259,920 to Law.**

Regarding claims 8 and 18-20, as applied above, Lowe or the APA in view of Walker and Fishter et al. teach the method of the invention substantially as claimed, but do not expressly teach a reference panel made of the same metal as the at least one blade to monitor the etching rate.

However, Law teaches the use of a reference panel made of the same metal as the workpiece in order to determine etch rate for the process. (See Col. 1, Lines 5-38)

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the process of the APA or Lowe in view of Fishter et al. to use a reference panel made of the same material as the treated blade in order to accurately determine the etch rate and thus predict the change in dimensions of the workpiece improving the efficiency of the process. Further, since the etch rate of the reference panel inherently predicts the amount of material removed from the workpiece, and thus the balance of the blisk, it would have been obvious to one of ordinary skill in the art at the time of invention to use the reduction in thickness of the reference panel to predict whether the treated blisk is balanced.

Regarding Claim 19, titanium, steel, nickel, tungsten and alloy thereof are well known for construction of turbine blades and the like, as shown by Fishter et al for example, and would therefore be obvious to use as reference panel metals.

### **Conclusion**

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).




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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (571) 272-1433. The examiner can normally be reached on Monday-Friday (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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